DOCUMENT DATA FORM WTCI-682-P **Your Name: Nick Carino**

Document Title or Description (max. 254 characters): Circle: Same as cover (or fill in below)
Transmittal of Excel file giving individual fireproofing thickness data included in the tenant alteration reports (30-P)

Include work order no. and floor no. if applicable

Roll #:	**Doc. ID (report #, dwg. #):**	
Document Date: April 7 2004	**Document Author Name:** Frank Lombardi	**Author Organization:**

KEYWORDS – HIGHLIGHT ALL THAT APPLY

Level 1

Bankers Trust	Project 5	WTC 3 - Marriot Hotel
Below Grade	Project 6	WTC 4 - South Plaza Bldg.
Concourse	Project 7	WTC 5 - North Plaza Bldg.
Electrical Substation	Project 8	WTC 6 - Customs House
Liberty Plaza	WFC 1 - Oppenhiemer Dow	WTC 7
PATH Station	WFC 2 - Tower B	WTC Complex
Project 1	WFC 3 - American Express	WTC Plaza
Project 2	WFC 4 - Tower D	
Project 3	WTC 1 - North Tower	Add
Project 4	WTC 2 - South Tower	

Level 2

Accident analysis & risk	Fire protection	Misc. Performance Problems	Tenant alterations
Architectural	Fire service	News coverage	Tenant Space
Data request	Landscaping	Police	Add
Emergency management	Management	Security	
Evacuation	Mech./elec.	Structural	

Level 3

1993 explosion	Deck	Hat truss	Shop drawings
A/E fitout	Deflection	Human comfort	Shortening
A-242	Demolition	HVAC	Slab
A-36	Design	Index	Slurry wall
A-497	Detailing	Inspection	Smoke control
Aircraft impact	Doors	Insulation	Smoke test
Air cooled condensers	Drawings	Job number	Spandrel beam
Analysis	Eastern States Steel	Joist	Specifications
Angles	Egress	L-50	Splices
Antenna	Elevator	Lighting	Sprinkler
Artifacts	Emergency communications	Loads	Stability
Asbestos	Equipment	Maintenance	Stairways
Base plate	Erection marks	Marking	Standards
Beams	Escalator	Mesh reinforcement	Steel
Bid Invitation	Expansion joint	Mill inspection	Steel composition
Bow tie	Exterior columns	Model	Stiffness
Bracing	Fabrication	Mullion	Structural review
Bridging truss	Family member	Operations	Survivor
Calculations	Field survey	Paint	Tenant list
Carpet	Fire alarms	Partition layout	Testing
Ceilings	Fireproofing	Partitions	Tie
Certification	Fire spread	Photos	Tolerances
Chillers	Fire testing	Pipes	Transfer Girders
Cladding	Flag Pole	Plumbing	Triad
Collapse	Flammability	Prestressing	Truss
Columns	Floor	Probability, uncertainty	Vestibule
Communication systems	Floor load	Quality control	Vibration
Composite truss	Floor slab	Ramp	Walls
Computer output	Floor system	Reinforcing (strengthening)	Water supply
Computer program	Floor trusses	Renovation	Weather
Concrete	Foundations	Repair	Weight
Connections	Fracture	Research & Development	Weld detail
Construction	Frame	Roof	Weld size
Contract	Frame analysis	Safety	Welding
Core beams	Frequency	Schedule	Wind
Core columns	Fuel	Sculpture	Windows
Cranes	Furniture layout	Security system	Yield strength
Criteria	H Generators	Shear knuckle	
Dampers	Guidelines	Shear test	Add
Debris	Gypsum board	Shear Stud	

To: Terri McAllister,Monica Starnes
From: "John L. Gross" <jgross@nist.gov>
Subject: Fwd: Reply to NIST's 3/30/04 Request for Additional Information
Cc:
Bcc:
Attached: C:\Program Files\Qualcomm\Eudora\Attach\3-30-04 NIST request.doc;C:\Program Files\Qualcomm\Eudora\Attach\WTC Fireproofing-Discrete Values.doc;C:\Program Files\Qualcomm\Eudora\Attach\WTC Fireproofing Data.xls;

Terri and Monica,

Here is the Port Authority's response to my recent request.

John

X-Sieve: CMU Sieve 2.2
From: "Lombardi, Frank" <flombard@panynj.gov>
Sender: "Keough, Patricia" <pkeough@panynj.gov>
To: "'jgross@nist.gov'" <jgross@nist.gov>
Cc: "Begley, James" <jbegley@panynj.gov>, "Bhol, Saroj" <sbhol@panynj.gov>,
"Bognacki, Casimir" <cbognack@panynj.gov>,
"Englot, Joseph"
<jenglot@panynj.gov>,
"Groark, Thomas" <tgroark@panynj.gov>, "Lin, C. John" <jlin@panynj.gov>,
"Reiss, Alan" <areiss@panynj.gov>
Subject: Reply to NIST's 3/30/04 Request for Additional Information
Date: Wed, 7 Apr 2004 10:04:40 -0400
X-Mailer: Internet Mail Service (5.5.2653.19)
X-MailScanner:
X-MailScanner-From: pkeough@panynj.gov

Attached is correspondence that responds to the questions asked of Joe Englot in your March 30th letter to him. In addition to the Port Authority memo from Cas Bognacki to Joe dated 4/7/04 (attached), there is also an Excel file with data. Please note that the Excel file contains two workbooks: WTC 1 and WTC 2.

<<3-30-04 NIST request.doc>> <<WTC Fireproofing-Discrete Values.doc>>
<<WTC Fireproofing Data.xls>>

CONFIDENTIAL AND PRE-DECISIONAL COMMUNICATION

John L. Gross, Ph.D., P.E.
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WTCI-682-P

THE PORT AUTHORITY OF NY & NJ

MEMORANDUM

MATERIALS ENGINEERING DIVISION

TO: J. Englot
FROM: C. Bognacki
DATE: September 19, 2005
SUBJECT: **DISCRETE VALUES FOR HISTORICAL WTC FIREPROOFING THICKNESS AVERAGES**

COPY TO: D. Bailey, J. Bullard, R. Gill

Closer examination of the raw data supporting the 11/24/99 (1 WTC 79th Floor) fireproofing thickness average reported to the NIST showed additional readings recorded on a separate row of the field report. A total of 12 values were actually taken from the truss, not eight, which showed an actual average of 2.21 inches. The average apparently was miscalculated by using only the first ten values and then erroneously dividing by nine, which resulted in the reported average of 2.36 inches. All 12 values are listed in the table on the right, which shows that all results were greater than 1.5 inches. Average values were not more carefully checked since the individual readings were substantially above the required thickness.

Thickness, Inches	*Reading*
2 1/8	1
2 1/4	2
2 1/2	3
2 3/4	4
1 1/2	5
1 3/4	6
1 3/4	7
2 1/4	8
2 1/8	9
2 1/4	10
2 1/2	11
2 3/4	12
26 1/2	Mean: 2.21

As requested in the 3/30/04 NIST correspondence, the enclosed spreadsheet has been prepared by summarizing all available raw data for the floors requested. Again, most discrete and average measurements are substantially greater than the 1.5-inch thickness requirement necessary to meet the 2-hour rating. Only testing performed back in 1995 on WTC 2, when thickness requirements were established at 0.5 inches, showed averages of less than 1.5 inches.

Please feel free to contact me at (201) 216-2984 if there are any questions concerning these results.

C. Bognacki, P.E.
General Manager
Materials Engineering Division

Att.(1)

U:\Dorian\WTC_Disaster\NIST_FP_FROM_CB.doc

UNITED STATES DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
Gaithersburg, Maryland 20899-0001

WTCI-682-P

30 March, 2004

Joe Englot
Port Authority of New York and New Jersey

X

Dear Joe:

I would like to follow up on the Port Authority's responses to my letter of March 11, 2004. In that letter, item #4 was related to a request for individual measurements of fireproofing thickness, rather than averages. The Port Authority's response dated March 23, 2004, provided thickness measurement data for only one location (the 79th floor of WTC 1).

First, the average of the eight individual measurements reported in the Port Authority's letter is 2.11 in. while the Construction Audit Report indicated an average of 2.36 in. Either the individual measurements are incorrect or they are not from the same Construction Audit Report. Please clarify.

In addition, NIST's request was for all individual fireproofing thickness measurements from all locations tested for floors with upgraded fireproofing (floors 92-100 of WTC 1 and floors 77-78, 88-89, 92, 96-97 of WTC 2). Please provide the eight individual thickness measurements for all locations tested in the floors of interest.

Thank you in advance for your prompt attention to these questions.

With regards,

John L. Gross

John L. Gross, Ph.D., P.E.
Leader, Structures Group

NIST

Discrete Thickness Values
Historical WTC Fireproofing

Date of Report	4/2/1997	4/2/1997	4/2/1997	4/28/1998	4/28/1998	4/28/1998	4/28/1998	4/28/1998
To:	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz
From:	John Bullard	John Bullard	John Bullard	John Bullard	John Bullard	John Bullard	John Bullard	John Bullard
Building	1 WTC	1 WTC	1 WTC	1 WTC	1 WTC	1 WTC	1 WTC	1 WTC
Floor	92	92	92	93	93	93	93	93
Location/Test Area	331 south	249 east	411 west	337 south	337 south (re-test)	233 east	137 north	335 south
Minimum Thickness Required	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Reported Mean, inches	**3.05**	**2.83**	**2.78**	**1.80**	**1.95**	**1.84**	**2.25**	**1.80**
Discrete Gage #1	3 1/4	3	2 7/8	1 7/8	2 1/8	1 1/2	2 1/2	1 7/8
Discrete Gage #2	3	2 1/2	3	1 3/4	2	1 7/8	2 1/4	2
Discrete Gage #3	3	2 3/4	2 1/2	1 5/8	1 7/8	1 3/4	1 7/8	1 3/4
Discrete Gage #4	3 1/2	3	3	1 3/4	1 3/4	2 1/8	1 5/8	1 3/4
Discrete Gage #5	2 1/2	2 7/8	2 1/2	1 7/8	1 7/8	2 1/4	3	1 5/8
Discrete Gage #6				2	1 3/4	1 3/4	2 1/4	1 3/4
Discrete Gage #7					2	1 3/4	2 1/2	2
Discrete Gage #8					2 1/4	1 3/4	2	1 5/8
Re-Calculated Mean, inches	**3.05**	**2.83**	**2.78**	**1.81**	**1.95**	**1.84**	**2.25**	**1.80**

WTCI-682-P

682-P

Date of Report	4/28/1998	4/28/1998	12/27/1996	12/27/1996	12/27/1996	8/24/1998	8/24/1998	8/24/1998
To:	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz
From:	John Bullard	John Bullard	John Bullard	John Bullard	John Bullard	John Bullard	John Bullard	John Bullard
Building	1 WTC	1 WTC	1 WTC	1 WTC	1 WTC	1 WTC	1 WTC	1 WTC
Floor	93	93	94	94	94	95	95	95
Location/Test Area	239 east	435 west	329 east	233 north	131 west	329 south	235 east	429 west
Minimum Thickness Required	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Reported Mean, inches	**1.89**	**2.92**	**4.28**	**3.80**	**4.33**	**2.16**	**2.41**	**3.30**
Discrete Gage #1	2	2 7/8	4 1/4	4	4 1/2	2 3/4	1 7/8	3 1/8
Discrete Gage #2	1 7/8	3	4 1/4	3 3/4	4 3/4	1 7/8	2 1/8	3 1/8
Discrete Gage #3	1 3/4	2 3/4	4 1/8	3 3/4	4 1/4	2 3/8	2 3/8	3 3/8
Discrete Gage #4	2 1/4	3 1/4	4 1/2	3 1/2	4 1/8	2 3/8	2 1/4	3 3/8
Discrete Gage #5	2 1/8	2 3/4		4	4	1 7/8	3	3 1/8
Discrete Gage #6	1 3/4	3 1/2				1 7/8	2 3/4	3 1/4
Discrete Gage #7	1 3/4	2 1/2				2	2 3/8	4
Discrete Gage #8	1 5/8	2 3/4				2 1/8	2 1/2	3
Re-Calculated Mean, inches	**1.89**	**2.92**	**4.28**	**3.80**	**4.33**	**2.16**	**2.41**	**3.30**

Date of Report	10/22/1998	10/22/1998	10/22/1998	10/22/1998	10/22/1998	10/22/1998	11/19/1998
To:	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz
From:	Dorian Bailey	Dorian Bailey	Dorian Bailey	Dorian Bailey	Dorian Bailey	Dorian Bailey	John Bullard
Building	1 WTC	1 WTC	1 WTC	1 WTC	1 WTC	1 WTC	1 WTC
Floor	96	96	96	97	97	97	98
Location/Test Area	239 east	143 north	439 west	331 south	241 east	143 north	113 north
Minimum Thickness Required	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Reported Mean, inches	**3.03**	**3.16**	**3.16**	**2.64**	**2.17**	**2.22**	**2.91**
Discrete Gage #1	Discrete measurements not available						3
Discrete Gage #2							2 3/4
Discrete Gage #3							2 1/2
Discrete Gage #4							3 1/4
Discrete Gage #5							2 3/4
Discrete Gage #6							2 1/2
Discrete Gage #7							2 3/4
Discrete Gage #8							3 3/4
Re-Calculated Mean, inches							**2.91**

Date of Report	11/19/1998	11/19/1998	11/20/1998	11/20/1998	11/20/1998	11/20/1998	11/20/1998	11/20/1998
To:	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz
From:	John Bullard	John Bullard	Dorian Bailey	Dorian Bailey	Dorian Bailey	Dorian Bailey	Dorian Bailey	Dorian Bailey
Building	1 WTC	1 WTC	1 WTC	1 WTC	1 WTC	1 WTC	1 WTC	1 WTC
Floor	98	98	99	99	99	100	100	100
Location/Test Area	232 east	325 south	427 west	339 south	229 east	433 west	337 south	153 north
Minimum Thickness Required	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Reported Mean, inches	**2.83**	**2.52**	**2.84**	**2.22**	**2.23**	**2.80**	**3.17**	**3.38**
Discrete Gage #1	2 3/4	2 3/8	2 1/2	2 1/2	2 1/8	3 1/8	3 1/2	3 1/2
Discrete Gage #2	2 1/4	2 1/2	2 3/4	2 3/8	2 1/4	3 1/4	3 1/2	2 1/2
Discrete Gage #3	2 1/2	2 3/4	2 5/8	2 1/8	2 1/8	2 1/2	3 1/4	3 1/4
Discrete Gage #4	3 1/4	2 3/4	2 5/8	2 1/8	2 1/4	3	1 3/4	3 3/4
Discrete Gage #5	3	1 3/4	3	2 1/8	2 3/8	3	3 1/2	3 3/8
Discrete Gage #6	2 7/8	2	3 1/2	2 1/8	2	2 1/2	4	3 1/2
Discrete Gage #7	3	3	2 7/8	1 3/4	2 1/2	2	2 1/2	3 3/8
Discrete Gage #8	3	3	2 7/8	2 5/8	2 1/4	3	3 3/8	3 3/4
Re-Calculated Mean, inches	**2.83**	**2.52**	**2.84**	**2.22**	**2.23**	**2.80**	**3.17**	**3.38**

Date of Report	6/9/1998	6/9/1998	6/9/1998	4/3/1998	4/3/1998	7/5/2000	7/5/2000	7/5/2000	5/5/1999
To:	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz
From:	John Bullard	John Bullard	John Bullard	John Bullard	John Bullard	Dorian Bailey	Dorian Bailey	Dorian Bailey	Dorian Bailey
Building	2 WTC	2 WTC	2 WTC	2 WTC	2 WTC	2 WTC	2 WTC	2 WTC	2 WTC
Floor	77	77	77	78	78	88	88	88	89
Location/Test Area	121 east	353 west	303 west	327 east	157 west	213 north	157 west	315 east	329 east
Minimum Thickness Required	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Reported Mean, inches	**2.67**	**2.11**	**2.60**	**2.50**	**2.75**	**1.89**	**2.36**	**2.13**	**2.80**
Discrete Gage #1	3 1/8	2	2 5/8	2 1/2	2 1/2	2	2 3/4	2 1/4	2 1/4
Discrete Gage #2	2 1/2	1 3/4	2	2 1/2	3 1/2	1 1/2	2 3/4	2 1/2	3 3/4
Discrete Gage #3	2 3/4	2 5/8	2 1/3	2 1/4	3 1/4	1 3/4	2 1/2	2 1/8	3
Discrete Gage #4	2 1/2	2 1/8	2 3/8	2	2	2 1/4	2 3/4	2	2 7/8
Discrete Gage #5	2 1/8	1 7/8	3	2 1/4	2 7/8	2 1/4	2 1/2	2 1/8	3
Discrete Gage #6	2 3/4	2 1/2	2 7/8	3	2 3/4	2	1 1/2	1 3/4	2 1/2
Discrete Gage #7	2 7/8	2 1/4	3 1/3	3	2 7/8	1 1/2	2 1/4	2 1/2	2 1/4
Discrete Gage #8	2 3/4	1 3/4	2 3/8	2 3/4	2 1/4	1 7/8	1 7/8	1 3/4	2 3/4
Discrete Gage #9				2 1/4					
Discrete Gage #10				2 1/2					
Discrete Gage #11									
Discrete Gage #12									
Re-Calculated Mean, inches	**2.67**	**2.11**	**2.60**	**2.50**	**2.75**	**1.89**	**2.36**	**2.13**	**2.80**

Date of Report	5/5/1999	5/5/1999	2/26/1998	2/26/1998	2/26/1998
To:	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz	Eli Moscovitz
From:	Dorian Bailey	Dorian Bailey	John Bullard	John Bullard	John Bullard
Building	2 WTC	2 WTC	2 WTC	2 WTC	2 WTC
Floor	89	89	92	92	92
Location/Test Area	231 north	127 west	335 east	421 south	127 west
Minimum Thickness Required	1.5	1.5	1.5	1.5	1.5
Reported Mean, inches	**2.70**	**2.95**	**2.83**	**3.00**	**2.67**
Discrete Gage #1	2 1/4	2 7/8	2 1/4	2	2 3/4
Discrete Gage #2	2	2 7/8	2 1/4	2 1/2	2 3/4
Discrete Gage #3	2 3/4	4	2	3 1/4	2 3/4
Discrete Gage #4	2 1/4	3 1/4	2	2 3/4	2 3/4
Discrete Gage #5	3 1/4	2 1/2	3 1/2	4	2 1/4
Discrete Gage #6	4	2 3/8	3	3 1/2	2 3/4
Discrete Gage #7	2 3/8	2 7/8	3 1/4	2 1/4	2 1/2
Discrete Gage #8	2 3/4	2 7/8	4 1/2	3 3/4	2 3/4
Discrete Gage #9			2.75	3.00	2.75
Discrete Gage #10					
Discrete Gage #11					
Discrete Gage #12					
Re-Calculated Mean, inches	**2.70**	**2.95**	**2.83**	**3.00**	**2.67**

Date of Report	3/1/1995	3/1/1995	3/1/1995	9/7/1995	9/7/1995	9/7/1995
To:	Tom O'Connor	Tom O'Connor	Tom O'Connor	Tom O'Connor	Tom O'Connor	Tom O'Connor
From:	Sy Solomon	Sy Solomon	Sy Solomon	John Bullard	John Bullard	John Bullard
Building	2 WTC	2 WTC	2 WTC	2 WTC	2 WTC	2 WTC
Floor	96	96	96	97	97	97
Location/Test Area	Area #1 West	Area #2 North	Area #3 East	315 22 feet west of east wall	217 12 feet south of north wall	113 30 feet east of west wall
Minimum Thickness Required	0.5	0.5	0.5	0.5	0.5	0.5
Reported Mean, inches	**0.90**	**1.75**	**1.90**	**1.42**	**0.75**	**1.25**
Discrete Gage #1	Discrete measurements not available					
Discrete Gage #2						
Discrete Gage #3						
Discrete Gage #4						
Discrete Gage #5						
Discrete Gage #6						
Discrete Gage #7						
Discrete Gage #8						
Discrete Gage #9						
Discrete Gage #10						
Discrete Gage #11						
Discrete Gage #12						
Re-Calculated Mean, inches						

WTC I-682-P